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No. 18

Selected Translations on Farm Machinery Plants

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[Following is a translation of selected articles from the Russian-language periodical Mashinostroitel' (Machine Builder), Moscow, No. 2, February 1960. Page and author are given under individual article headings.]

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I. MECHANIZATION IN AGRICULTURE

Pages 4-6

A. A. Isayenko,
assistant director
of the Special
Design Bureau of
the Rostov Agri-
cultural Machinery
Plant

The December Plenum of the Party Central Committee has presented agricultural machine builders with serious demands. The machines being produced at present do not meet the demands of agricultural machine operators. New organizational forms and the transfer of machinery to the collective farms have created new technological requirements. Machinery must be more versatile, compact, and reliable in operation.

What will Rostsel'mash [Rostov Agricultural Machinery Plant] do in the coming years for the nation's agriculture?

Several machines for mechanizing harvesting work have been designed by the plant's Special Design Bureau. Our fundamental achievement is a self-propelled chassis of 65-70 horsepower, equipped with a complex of mounted machines. In addition, we have developed several variations of machines for gathering straw and for three-stage grain harvesting and drawn up plans for production of rice harvesters and castor-bean plant combines.

The basic principle of the design of the UT-70 self-propelled chassis (figure 1) is that it is grouped with agricultural machines of the most varying design and purpose in a manner most convenient for each machine. It is possible not only to adapt the mounted machines to the chassis, which often leads to cumbersomeness of design, but, on the contrary, to adapt the chassis to the machines to be mounted. Accordingly, variants of the chassis have been designed with three or four wheels and either the driving suspension or the guiding wheels forward; with one or two driving axles; with different mutual arrangements of driving and guiding wheels; etc.

In addition, the basic design principle of the chassis provides for solidity and compactness of design of mounted machines in order to secure general solidity of the entire aggregate. This makes it possible to lighten the weight of the chassis and the aggregate as a whole.

The chassis is designed to be used in the capacity of a general draft machine for hauling heavy loads by trailer, both the product produced by the machine mounted on the chassis itself and other loads during use of the chassis in general hauling work.

Consequently, the design characteristics of the chassis are as follows:

The three-wheeled chassis drives easily under machines to be mounted. Mounting can be done quickly and safely in any machine storage place (open squares, machine sheds, etc.), using the hydraulic system of the chassis. Basic heavy machinery is transported on special wheels, to which it can be shifted in the field or in the manufacturing plant. Some machines, for example, swathers, are kept on adjustable supports, facilitating mounting.

The four-wheeled modification of this chassis is designed for working with large, heavy machines, for example grain combines, castor bean combines, and also loading platforms.

The machines are mounted on the chassis within a supporting framework and do not have hoppers, straw pilers, or other storage capacity for harvested products, but employ self-dumping trailers drawn behind the driving wheels of the chassis. This arrangement makes it possible to make the working aggregate more compact and lighter. Use of the mounted loading platform with a sideward tilting box and self-dumping trailers permits forming them into trains with a load capacity up to 10 tons.

Constructing the chassis with an interlocking differential and low-pressure or vaulted tires instead of the usual suspension of the driving wheels greatly increases the practicability of the chassis for work in difficult soils.

The following machines have been designed for mounting on the chassis: a grain combine with a capacity of 3 kilograms a second (figure 2); a row-crop harvester for cutting one or two swaths; a silage harvesting combine with a cut of 1.9 meters (figure 3); a three-row corn combine; a four-row castor bean combine (figure 4); a two-row potato harvester; a pickup or chopper for three-stage harvesting, with a capacity of 4-5 kilograms a second (figure 5); a bailer producing up to 8 tons an hour; and a self-dumping platform with a side or longitudinal tilting box, having a load capacity of 3.5 tons (figure 6).

Provision has also been made for mounting of other machines: a beet harvesting combine, a manure spreader, a liquid manure spreader with a tank capacity of 4 cubic meters, a three-bottom plow, and many others. The chassis has reversible transmission with five forward speeds and one reverse speed and a three range supplementary gear box producing 15 forward speeds ranging from one to 23 kilometers an hour and three reverse speeds. The chassis can be equipped with SMD-12 motors with 75, 70, and 65 horsepower and having electric starters or benzine starting motors. The rear suspension comes in two modifications: nonextensible with a road width of 2,314 mm. and extensible with a road width ranging from 2,100 to 3,114 mm. The suspension has planetary reducing gears.

The chassis frame is flat and tubular. On the top of the frame is the driver's space, on which the controls are located.

In addition to the chassis and its mounted machinery, the Special Design Bureau has designed machines for harvesting straw.

Our designers have followed three directions in this task. In cooperation with the All Union Institute of Agriculture they have devised a method of gathering straw behind the combine with a sweeprake dumper and straw rack (figure 7).

Under this method the sweeprake dumper, mounted on a DT-54 tractor, gathers the piles of straw left by the combine and hurls the straw over into the straw rack, which is hitched behind the tractor. The rack has a load capacity of 140 or 200 cubic meters, which forms a large stack of straw. The accumulated straw is carried out to the edge of the field and there dumped for protracted storage.

Another method of gathering straw is by means of a sweeprake stacker (figure 8) and a buckrake. The buckrake bucks the straw to the edge of the field, while the sweeprake stacker, mounted on a Belarus' tractor, puts the straw into stacks.

Finally, a third method of harvesting straw after combining is by equipping the combine with a straw baler. In this method picking up the bales from the field is mechanized. The bale picker consists of a conveyer hitched to the side of a GAZ-51 truck. Moving with the truck, it picks up the bales and puts them into the truck box.

Thus, agricultural machine operators are to receive in the near future an assortment of new, improved harvesting machines.

FIGURE APPENDIX

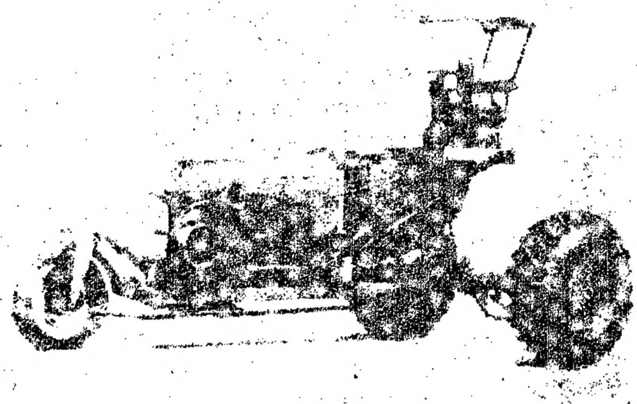

Figure 1. Three-wheeled variant of the UT-70 self propelled combine.

Figure 2. KN-3 grain combine on a self propelled chassis.

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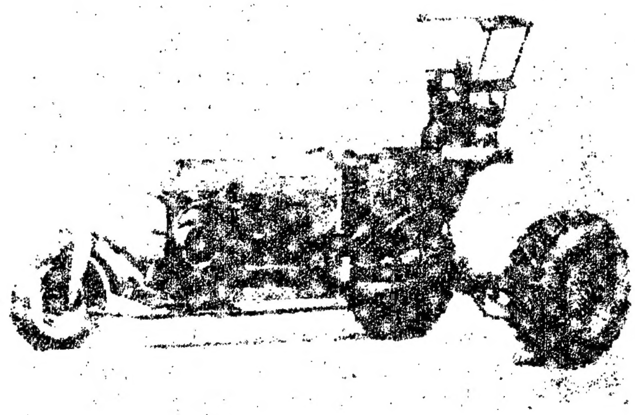

Figure 1. Three-wheeled variant of the UT-70 self propelled combine.

Figure 2. KN-3 grain combine on a self propelled chassis.

Figure 3. Silage combine on a self propelled chassis.

Figure 4. Castor bean combine on a self propelled chassis.

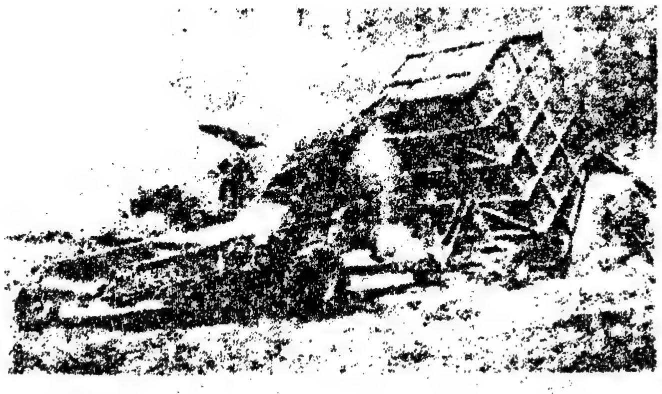

Figure 5. Box type pickup chopper unloading chopped material on a stationary platform.

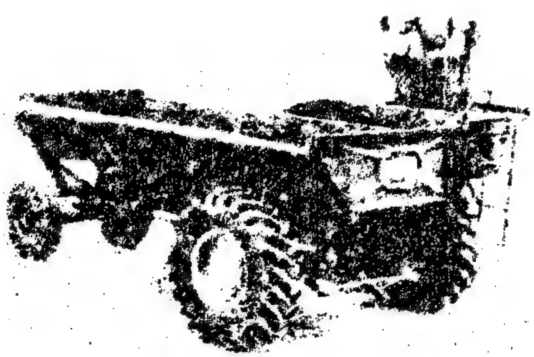

Figure 6. Loading platform on a self propelled chassis.

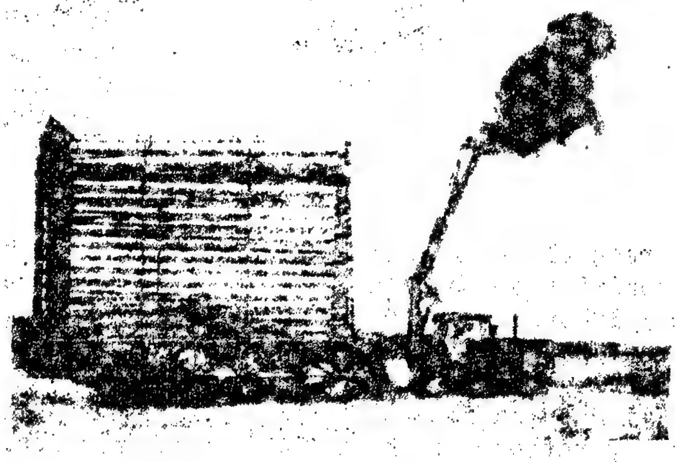

Figure 7. SPG-05 straw rack with sweeprake dumper.

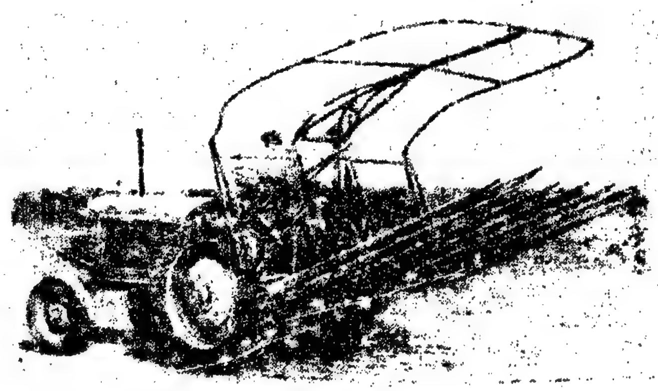

Figure 8. Sweeprake stacker mounted on a Belarus' tractor.

II. MECHANISMS AND AUTOMATIC DEVICES USED IN FOUNDRIES

Pages 7-9

L. M. Baryshevskiy,
head metallurgist of
the Rostov Agricultural Machinery
Plant

Until recently there existed in the generally highly mechanized foundries of the plant backward sections carrying on heavy physical labor. Loading of molds before casting, removal of molds, loading charges into the cupolas, and several other operations were done by hand. Originally, automation and mechanization were limited to particular operations, that is, to separate and more toilsome operations of the technological process.

At present there is complete automation of the process of loading molds before casting. This is done on four vertical, closed-cycle conveyers and one horizontal, closed-cycle conveyer. For loading molds on the vertical conveyers special chain carriers are used (figure one). The drive of the loading conveyer is connected by chain to the casting conveyer, thus fully synchronizing the movement of the two conveyers.

The design of the equipment for loading molds before casting on a horizontal conveyer was borrowed from the Stalingrad Tractor Plant. The equipment consists of four-wheeled carts on which the loads are attached, moving along a circular railed track. The drive is turned directly by the casting conveyer. The use of automated equipment for loading molds reduces costs, as it releases workers, who may be employed on other operations. The annual saving is 400,000 rubles.

Since 1956 six foundry conveyers have been equipped with a system of automated distribution of molding earth through feeding bunkers at the molding machines (figure 2). Spillers on the belt conveyer are regulated by the maximum level of the mixture in the bunker, which is determined by a pendulum indicator. A pneumatic system of regulation is used, which is distinguished by simplicity and flexibility in distribution of earth, in contrast to a coercive system. Automated distribution of molding earth releases workers from arduous work and unpleasant conditions caused by rising dust and produces an annual saving of over 100,000 rubles.

The plant has automated the hardest foundry operation--emptying the molds. In the pig iron shop, for example, there is in operation an automatic device for emptying molds on all foundry conveyers.

The automatic machine for emptying molds on the horizontal conveyer has an eccentric table for emptying 560 x 560 mm. and 680 x 680 mm. flasks which is switched on periodically for 4-6 seconds in each cycle. In addition, there are a continuous action inert grating for emptying molds, a system of pneumatic pushers, and belt and roller conveyers for distribution of the empty flasks.

An aprong conveyer is used for removing the castings from under the grating. The molding earth falls into a bunker and from there into a special conveyer for removing the earth. The separate mechanisms of the apparatus operate in definite sequence set by an electrical blocking system. The capacity of the apparatus is 1,400 molds a shift.

The mold-emptying automatic device on the vertical conveyers (figure 3) has an eccentric table and grating. The table is switched on either periodically or for continuous work. In addition, the device has a pneumatic pushing system and intermediate tables. The castings are removed by an apron conveyer and the earth by a belt conveyer. In the process of emptying the flasks special spring valves on the table are employed. The capacity of this equipment is 6,400 molds a shift.

In 1958 an apparatus was introduced and is being used successfully today for emptying molds on the horizontal conveyer in the wrought iron shop (figure 4). The apparatus is equipped for emptying flasks with 600 x 600 mm. dimensions and a height of 180 and 230 mm. The working cycle of the apparatus is 6 to 8 seconds. Its capacity depends on the speed of the conveyer. Under normal speed capacity is 1,200-1,400 molds a shift. For cooling the castings after emptying the molds, the conveyer is equipped with a vertical cooling chamber, into which the castings are carried by an apron conveyer. Inside the chamber moves an intermittent bucket elevator. The chamber occupies a small area. The cooling gases and heat are completely withdrawn from the chamber into the atmosphere, and the casts are loaded and unloaded automatically. In the future such chambers will be installed on all the conveyers of the pig iron shops.

The technical and economic efficiency of the automatic equipment for emptying molds is reflected in the following data:

Shop	Conveyer	Workers released	Annual Savings in 1000 rubles	Capital Costs in 1000 rubles	Period of use
Pig iron	Vertical-closed cycle	8	175	203	one year and 2 months
	Vertical-closed cycle	10	240	270	one year and 1.5 months
	Horizontal-closed cycle	8	308	208	7 months
Wrought iron	Horizontal-closed cycle	8	300	294	one year

In 1958 a rebuilt section of the wrought iron shop was equipped with a horizontal conveyer. Here were installed automatic devices for distributing earth and emptying molds, and grouped arrangement of molding machines and direct assembly of molds on the conveyer were organized. In addition, the coring division was rebuilt, and the finishing work section was transferred to a special location. A conveyer line was also organized for processing castings, and intershop and intrashop hauling of casts was mechanized.

As experience in devising and installing various mechanisms and automatic machines has accumulated it has become possible to resolve the most intricate tasks in automating such processes as pouring molds and cleaning casts. The foundry workers of Rostsel'mash have systematically undertaken the creation of complex semi-automatic conveyer lines on the basis of various designed and applied mechanisms.

At present the horizontal conveyer in the pig iron shop has installed a six-position automatic machine of the carousel type, which makes possible mechanization of molding, assembly of molds, and transporting molds and flasks between operating points.

This automatic machine has two six-position circular conveyers for parallel casting of upper and lower half-molds. An intermittent movement is communicated to the conveyers by an electromechanical drive. The cycle of preparing molds occupies altogether 15 seconds. The automatic machine is regulated by a controlling device through a pneumatic electrical valve system. The extreme positions of the conveyers and their mutual connections are limited by an end switch. For packing the molds shaking is applied. The automatic system is equipped with a tilter for the lower molds and couplings for the half-molds. It is designed for flasks with

dimensions of 600 x 600 mm. and a height of 300 mm. The designed capacity of the machine is 240 molds an hour.

In addition, the plant is developing plans to install automatic molding equipment for flaskless molding on vertical, closed-cycle conveyers. Continuous-action blasting cylinders are being devised, designed to clean pig iron and steel casts weighing up to 25 kg. This machine will be composed of two cylinders for cleaning casts and removing earth particles. A special mechanism is being provided for distributing and sorting blasting material.

The introduction of semiautomatic lines for casting by the flask or flaskless methods permits large financial savings, improves working conditions, and raises the technology of production.

FIGURE APPENDIX

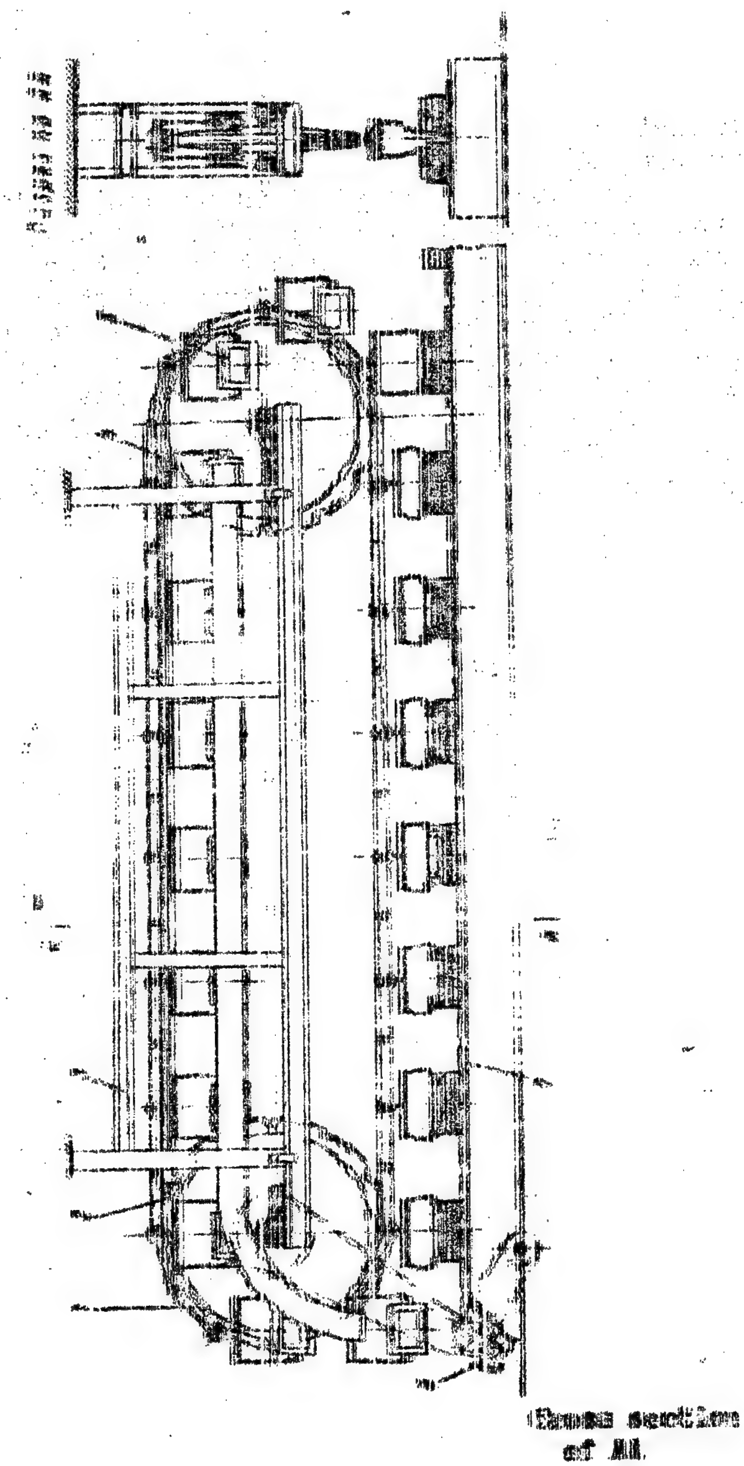

Figure 1. Vertical closed cycle conveyor for loading molds.
1—chain; 2,4—sprocket wheels; 3—frame; 5—load;
6—drive; 7—casting conveyor

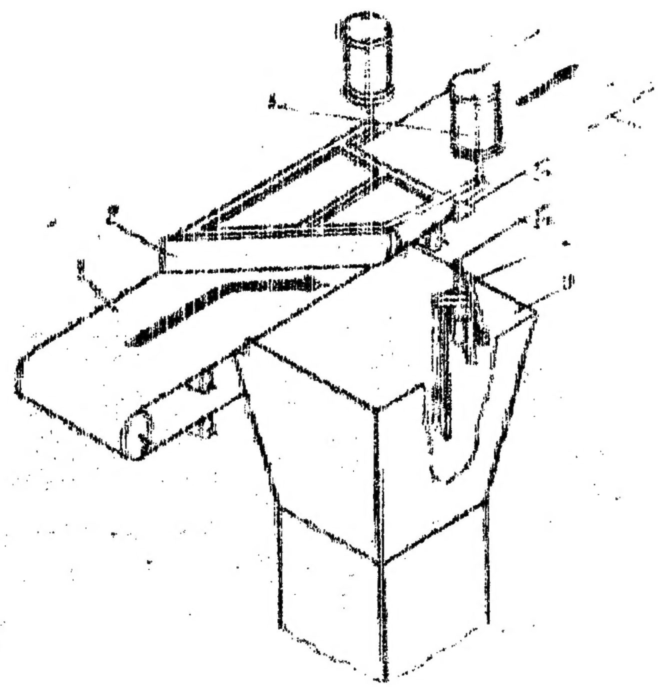

Figure 2. System for automating distribution of earth:

1--belt; 2--spiller; 3--bunker; 4--pendulum indicator; 5--pneumatic cylinders

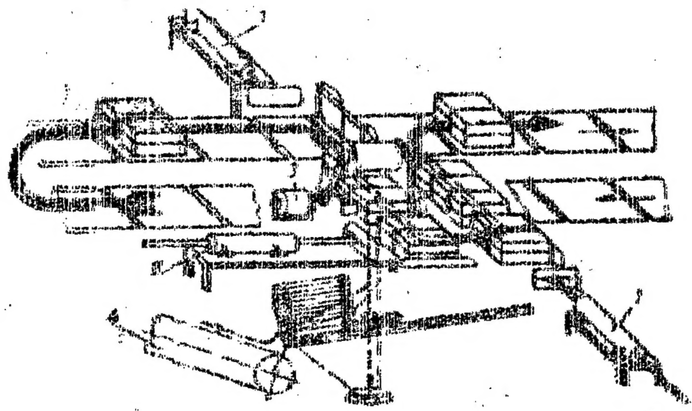

Figure 3. Diagram of automated emptying of flasks on a vertical closed cycle conveyer:

1--pusher; 2--carrier for transfer of molds; 3--drive; 4--carrier for removing earth

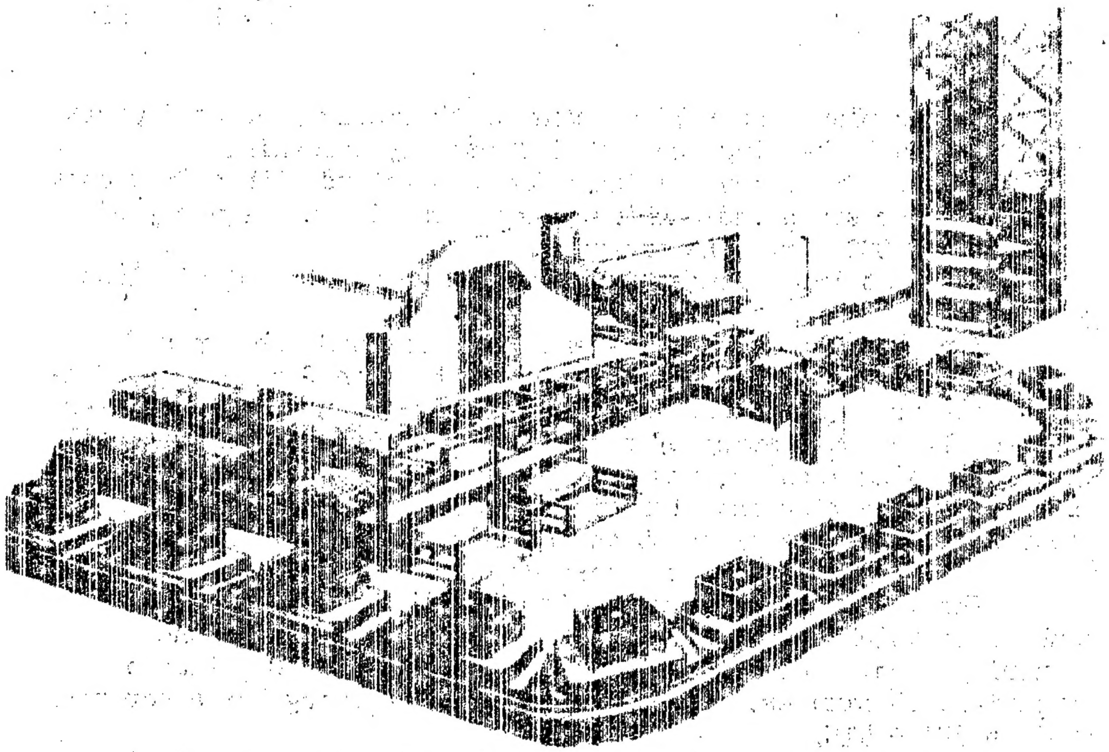

Figure 4. Diagram of automated emptying of molds on a horizontal closed cycle conveyor.

III. HIGH FREQUENCY HARDENING OF PIG IRON

Page 25

A. Z. Berlin,
engineer in the
Central Laboratory
of the Rostov
Agricultural
Machinery Plant

At our plant about 70 percent of thermally processed parts are subjected to heating under high frequency hardening.

In high frequency heating valve generators with a frequency of 250,000 hertzians and machine generators with a frequency of 8,000 and 10,000 hertzians are used.

Of great interest is high frequency hardening of pig iron parts.

Sprocket wheels of different diameters and hub types for the self-propelled combine are subjected to high frequency hardening. They are heated under machine generators on a semiautomated conveyer line, consisting of a hardening station, a hardening oil tank, a washing machine, and a tempering oven. The sprocket wheel is mounted on a ring inductor with a magnetic conductor, which secures even heating of teeth and socket. Then it is heated to 860-880° C. for 30 to 100 seconds, depending on diameter.

The heated sprocket wheel is sent to the hardening oil tank, from which it proceeds to the washing machine and the tempering oven. The tempering temperature is 400° C., time of tempering, 45 minutes, and hardness after tempering has a hardness ratio = 321 ÷ 415.

Hardening of sprocket wheels under high frequency heating instead of expansion heating makes it possible to eliminate defective output caused by changes in the diameters of hubs and width of rabbets. This has sharply raised the efficiency of assembly work.

The hub of the pulley is hardened under the machine generator.

During heating the part is revolved. Afterwards it is cooled in oil.

Tempering of the hub is done in a gas furnace chamber at a temperature of 400° C. Time of tempering is 60 minutes, and hardness after tempering is a hardness ratio = 321 ÷ 415.

High frequency hardening of hubs in place of expansion heating has produced an annual saving of 70,000 rubles for the plant.

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